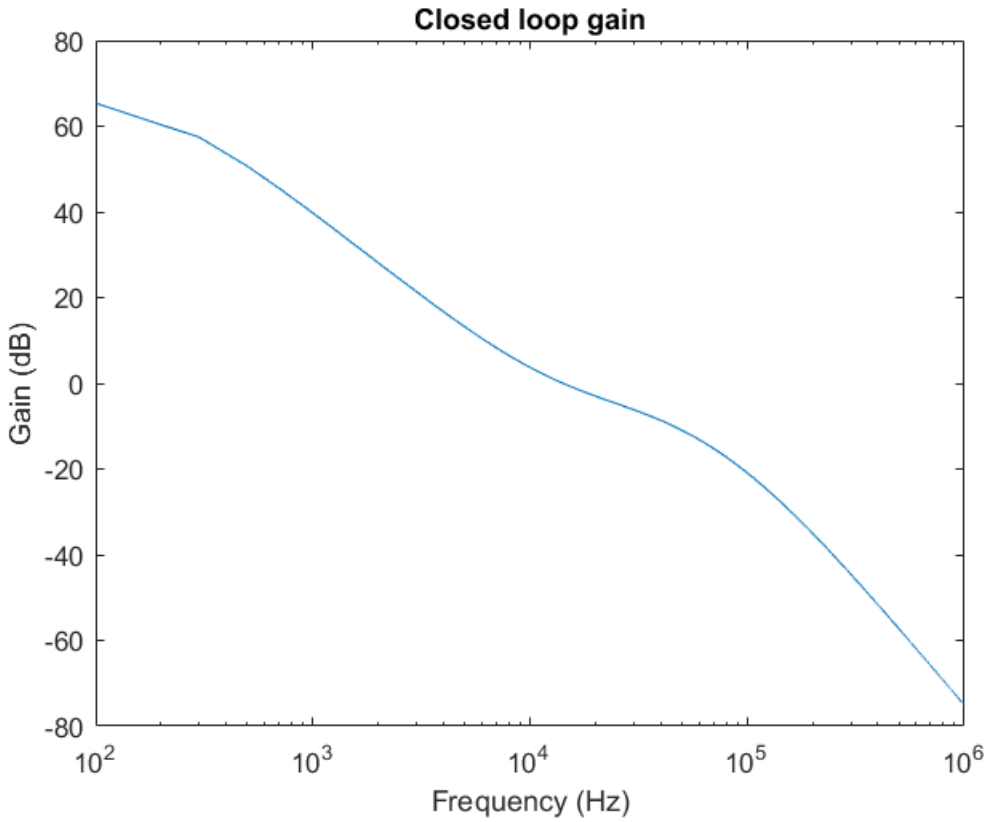
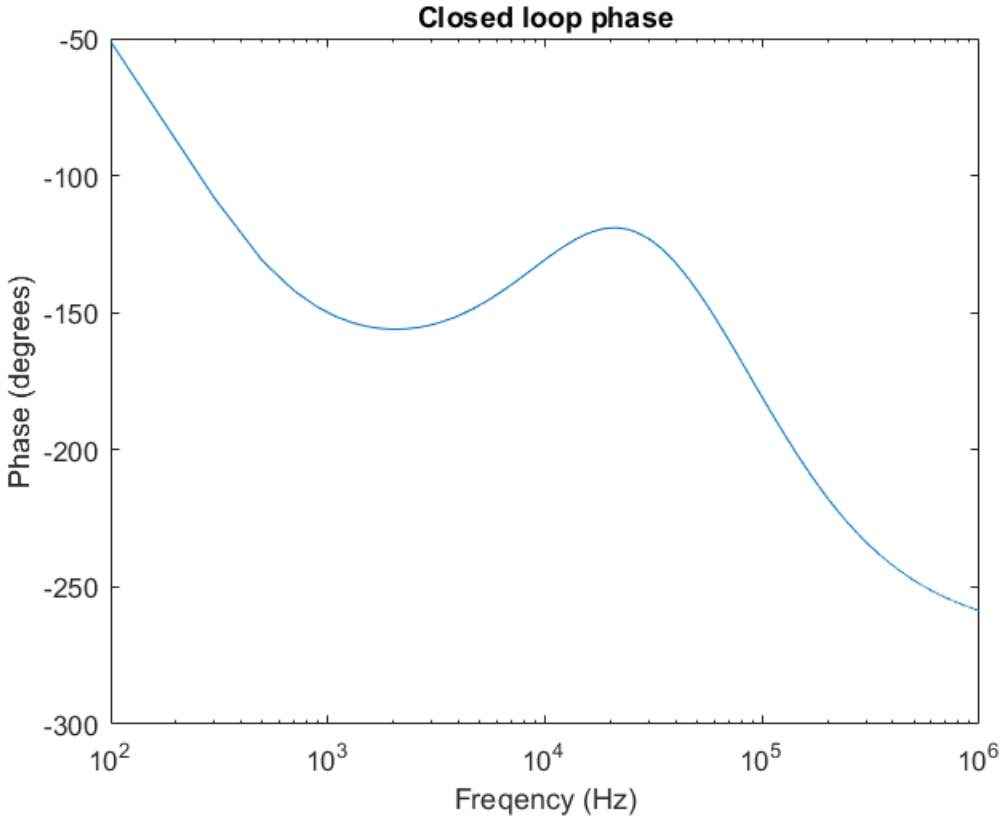
```
% Dylan Doucette & Corbin Study
% ECE 402
% Loop Compensation Network Design

s=linspace(100*2*pi,1e6*2*pi,5000);
n=2;                    % Number of phases
Vin=36;
Vo=28;
Ls=0.00001;             % Inductor
Ri=0.004*22.856;        % Resistance of sense resistor multiplied by
 error amplifier gain
Tsw=1./150000;
RCo=0.014;              % ESR of output capacitor
Co=3.*0.000330;         % Output capacitance
RL=0.875;               % Max load resistance
D=Vin/Vo;               % Ideal duty cycle
Toff=(1-D).*Tsw;        % Off time of high-side MOSFETs
w2=pi./(Tsw);
sn=Ri.*(Vin-Vo)./Ls;    % Inductor current slopes
sf=Ri.*Vo./Ls;
se=Vin.*Ri./Ls;         % Slope of internal compensation ramp
Q2=1./(pi.*((sn+se)./(sn+sf)-0.5));
k2=-Ri./(Ls.*Q2.*w2);
Gcv=n.*(1./(1+((1i.*s)./(Q2.*w2))+((1i.*s).^2)/(w2.^2))).*(RL./
 (Ri.*(1-(k2.*RL./Ri)))).*((RCo.*Co.*1i.*s+1)./((((RL+RCo).*Co-
(RL.*RCo.*Co.*k2./Ri))./(1-(RL.*k2./Ri))).*s.*1i+1));      % Transfer
 function for current mode buck converter
Kref=0.02857;
gm=n.*0.002;            % Gain of voltage feedback amplifier
Ro=1.5e6;               % Output resistance of internal voltage
 feedback amplifier
Rth=16900;              % Component values in compensation network
Cth=620.*1e-12;
Cthp=240.*1e-12;
sthp=1./(Rth.*(Cth.*Cthp)./(Cth+Cthp));     % Pole 1 generated by loop
 compensation network
sthz=1./(Rth.*Cth);                         % Zero generated by loop
 coompensation network
spo=1./(Ro.*Cth);                           % Pole 2 generated by loop
 compensation network
As=gm.*Ro.*(((1+(1i.*s)./sthz))./((1+(1i.*s)./spo).*(1+(1i.*s)./
 sthp)));        % Transfer function of compensation network
Ts=Gcv.*Kref.*As;        % Closed loop transfer function of current
 mode buck converter
f=s./(2.*pi);
figure;
semilogx(f, 20*log10(Ts));
title('Closed loop gain');
xlabel('Frequency (Hz)');
ylabel('Gain (dB)');
figure;
semilogx(f, rad2deg(phase(Ts)));
```

```
title('Closed loop phase');
xlabel('Freqency (Hz)');
ylabel('Phase (degrees)');
```

Warning: Imaginary parts of complex X and/or Y arguments ignored





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